



IN REPLY  
REFER TO:

MP-700  
PRJ-1.10

## United States Department of the Interior

BUREAU OF RECLAMATION  
Mid-Pacific Regional Office  
2800 Cottage Way  
Sacramento, California 95825-1898

JAN 20 2004

RECEIVED  
SACRAMENTO  
CIVIL/6068  
04 JAN 20 PM 4:41

Mr. Les Grober  
Senior Land and Water Use Analyst  
Regional Water Quality Control Board  
Central Valley Region  
11020 Sun Center Drive, #200  
Rancho Cordova, California 95670

Subject: Review and Comments for "Amendments to The Water Quality Control Plan for the Sacramento and San Joaquin River Basins for The Control of Salt and Boron Discharges into the San Joaquin River" (November 2003 - Public Review Draft)

The Bureau of Reclamation, (Reclamation), Mid-Pacific Region, Regional Water Quality Coordination Program, has reviewed the subject report. Reclamation continues to hold the position that the draft Basin Plan Amendment and technical supporting documents require major revisions due to the many assumptions made throughout the report (see enclosed Comments). Some major concerns are:

- The use of 52 mg/L concentration for the Delta Mendota Canal background is unreasonable and not based on sound science.
- A salt and water budget needs to be developed that includes a reasonable estimate of all parameters and these parameters need to be applied consistently basin-wide. The water balance would need to include both surface and ground water.
- The East-side water projects are not identified for their impacts of modified timing, degraded water quality, and reduced flow to the San Joaquin River.
- The cost estimates to dischargers need further analysis. The water users will ultimately pay for Reclamation's mitigation cost per Reclamation law.
- There are many redirected effects from other TMDLs. The Regional Water Quality Control Board should consider bundling all pollutants on the 303(d) list on the Lower San Joaquin River. Developing a unified watershed approach would be more effective than a piece-meal approach.

- Recommendations in the Basin Plan may place Reclamation's responsibilities beyond our legal authority.

We feel our concerns are valid and we look forward to working with you to find a resolution to these issues. If you have any questions, please feel free to contact Lee Mao, Regional Water Quality Coordinator at 916-978-5089, or Michael Delamore, San Joaquin Drainage Program Manager, at 559-487-5039.

Sincerely,

  
for Alan R. Candlish  
Regional Planning Officer

Enclosure

cc: Susan Ramos  
Assistant Regional Director  
Bureau of Reclamation  
2800 Cottage Way  
Sacramento, California 95825

Bill Luce  
Area Manager, SCCAO  
1243 N Street  
Fresno, California 93721

Chet Bowling  
Operations Manager, CVO  
3310 El Camino Avenue, Suite 300  
Sacramento, California 95821

**Comments for Lower San Joaquin River  
Salt and Boron Technical Report  
Appendix 1: Technical TMDL Report**

**Comments**

1. Page 1-31, fourth paragraph: “The DMC supplies a volume of water that is roughly equal to the average water delivered to the exchange contractors. . .”. This statement is misleading and needs revision. The DMC provides water for exchange contractors, water to wetlands, other agricultural lands, and other users in the basin.
2. Page 1-31, last paragraph: The Regional Board used the 1977 to 1997 period to develop the TMDL. This 20-year period of record was abnormally dry and not representative of the normal hydrograph. The 20-year period also did not include the implementation of the Grassland Bypass Project, which improved water quality in the Grasslands area and the San Joaquin River. We suggest the period of record to include the 1998-2002 timeframe. The Regional Board has daily salt and boron data for the San Joaquin River at Crows Landing from October 1, 1996 through October 31, 2003 posted at <http://www.swrcb.ca.gov/rwqcb5/programs/agunit/bypass/stc504s97.htm>. Using the most recent data that reflects current hydrological management of the region could allow more salt to be discharged during high flow periods and should give more monthly separation of the low values shown in Table 4-2.
3. Page 1-32, Table 3-2, “DMC Salt Contributions by Sub-area 1977-1997”: The table indicates 423 and 90 tons/year of salt is imported to the Grasslands and Northwest areas, respectively. Are the numbers corrected for pre-development salt loads? If not, they should be adjusted appropriately.
4. Page 1-32, Table 3-2: Based on the information in Table 3-2, a substantial salt load comes from the Northwest side. How much of this loading is from pre-development? It appears unusual that the Grasslands area retains salt (423 thousand tons imported/400 thousand tons emitted) while the Northwest side releases a larger salt load (90 thousand tons imported/320 thousand tons emitted).
5. Page 1-32: Table 3-2 states that the DMC imports 423 k-tons of salt to the Grasslands area. There must be a calculation error for salt carried by the DMC to the pool. The DMC provides 210 k ac-ft to the Mendota Pool each year (see Table 3-5, Page 1-47 for volume to Grasslands) and has a salinity of 317 mg/L (see Table 3-4, Page 1-44). Therefore salt from DMC delivery to the pool is:  
  
$$(210 \text{ k ac-ft}) \times (1.23 \times 10^6 \text{ L/ac-ft}) \times (317 \text{ mg/L}) \times (1.1 \times 10^{-9} \text{ tons/mg}) = 90 \text{ k-tons}$$
6. When analyzing the data presented in Tables 3-3, 3-6, and 3-7, there are inconsistencies in the salt loads. It appears the controllable salt and boron loads presented in Table 3-7 are too high, particularly when considering the uncontrollable load from the Deep-Coast Range ground water presented in Table 3-3. The TMDL report concludes that if the irrigation of

agricultural crops in the valley continues in the future, controllable loads would be significantly less than what is presented in the report. However, agricultural surface return flows and subsequent salt loads (most feasible for reducing salt loads) might be reduced through improved water management and extensive conservation efforts in the valley. Conversely, this may not always be the case. By reducing surface return flows, the salinity concentrations might increase. When computing salt loads, it could be higher or lower, depending upon site-specific conditions. This could have either a negative or positive effect on salinity concentrations in the SJR. It should be noted that improved water management and/or conservation efforts to reduce surface water return flows could result in an increase in salinity concentrations and salt loads from the sub-surface drainage systems (shallow ground water).

7. Table 3-3 indicates that total estimated groundwater accretions and salt contribution to the SJR are 148,000 acre-feet per year, and 320,000 tons of salt per year respectively. The salt contribution shown in this table from the Deep Coast Range (lower aquifer under the SJR) is approximately 279,200 tons per year. It is not apparent how groundwater from the lower or Deep Coast Range aquifer is discharged into the SJR. Previous studies show the deep coastal aquifer separated from west and east side materials and the upper aquifer by a Corcoran clay layer, at depths up to 600 feet. Significant artesian pressure is required to cause large quantities of groundwater to be discharged into the SJR from the deep coastal aquifer. If the salt quantities shown in Table 3-3 are not coming from groundwater aquifers beneath the SJR, the question is: “where does 320,000 tons of salt per year originate?” Also, previous studies indicated deep coastal aquifer water is better quality than the aquifer above the Corcoran clay, which does not agree with Table 3-3. The soil salt balance effort through leaching would impact the shallow groundwater and not the confined deep coast aquifer. The deep coast aquifer should be considered natural background salt loading to the LSJR.
8. 1-43 last paragraph: *“This should be considered a minimum estimate of salt loading to the LSJR from the managed wetlands, as this analysis does not account for salt leaching from wetland soils and/or wetland derived groundwater accretions to surface drainage.”* The Regional Board should consider developing a complete water and salt budget for the wetlands. Using the numbers in the report, there is an additional 64,009 tons of salt entering the SJR from ground water accretions. ( $0.667 \text{ Ft seepage} * 54,720 \text{ acres in ponds} * 1,290 \text{ mg/l GW Quality (1590 mg/l average TDS groundwater} - 300 \text{ mg/l average flow weighted TDS DMC)} * 0.0013595 \text{ multiplier}$ ). There still would be additional groundwater inflow from the remaining 116,000 acres of non-flooded wetland.
9. Table 3-4, Wetland Flow and Loads: Where does the CVRWQCB account for the consumptive use of the vegetation on the wetland? Evaporation of a water body can be used to predict evapotranspiration but in this case the evaporation is only during September through April.
10. Page 1-47, Section 3.6 Summary and Evaluation, first paragraph: The TMDL report indicates the total average annual salt load from the Northwest and Grasslands sub-areas contribute 66% of the total salt load in the SJR at Vernalis. However, how these salt loads were determined is not apparent. A component of the total salt load imported from the Delta

via DMC. If water imported from the Delta had a zero salt load, the Northwest and Grassland sub-area contribution would remain significant due to continued leaching of salts from irrigated soils in these two sub-areas. Prior to the construction of Reclamation project facilities in this area, significant quantities of salt were deposited in these soils due to the use of high salinity groundwater from the deep coastal aquifer. Salt leaching is necessary for the sustained irrigation of lands in the San Joaquin Valley, and would endure assuming agriculture continues in the Valley. Therefore, Reclamation should not be responsible for all salt load reductions to the LSJR.

11. Page 1-48: Table 3-6. The values listed in the table are based on years 1977 to 1997. The salt load from the Grasslands Ag drainage is listed as 160 k-tons. The Grasslands Bypass Program started in October 1996 with the goal to reduce agricultural subsurface flows. The salt load has steadily decreased each year and was 116 k-tons in WY 2002. (Source- quarterly Grassland Bypass Program Quarterly Data Report, VQ303.1)
12. Page 1-48, Table 3-6: Using the values listed in Table 3-6, the LSJR transports 1,100 k-tons of salt to Vernalis in 3,670 k acre-ft of water each year. Therefore, salinity at Vernalis is calculated to be 221 mg/L or 362 us/cm using the 0.61 TDS/EC Vernalis ratio.
13. Page 1-50: Table 3-8 “Mean Annual Loading of Sub-area and Major Source Type 1977-1997”. The total sub-area totals for boron on the North West Side should be 350 tons. The Category Total also needs to be corrected.
14. Page 1-50: Second to last paragraph. “The project area also contains approximately 130 thousand acres of urban area, however, the majority of the salt loads generated from urban land uses are accounted for in the municipal and industrial discharges.” This isn’t totally correct, as the TMDL should account for the deep percolation and consumptive use from landscape irrigation where the water is supplied from the municipal utility. Also, the land application of treated wastewater will increase the eastside groundwater salinity and thus increase the salt discharge from the shallow groundwater system. This needs to be accounted for in the salt load allocations.
15. Page 1-56, Second Paragraph: The report states DWRSIM output from DWR Study 771 was used in determining critical design flows. What operation does DWRSIM depict? The version of DWRSIM used for this analysis includes a simplistic operation of the San Joaquin River, which was not approved by Reclamation. The SJR operation included in the DWRSIM version contained a set of fixed operations for the middle and upper SJR, and only the Stanislaus River was operated in the model. This does not provide an adequate representation of return flow sites and return flow quantities to use in an analysis, such as the TMDL development. This mode representation is only useful for gross mass balances in long-term water supply studies. It was never intended to provide a level of detail sufficient for TMDL analysis. Reclamation strongly urges the RWQCB to re-run the TMDL analysis using CALSIM 2 output instead of DWRSIM output. Also, the assumptions for the model run must be studied closely to guarantee they represent an appropriate level of development for use in the TMDL study.

16. Page 1-56: DWRSIM is a lump based modeling approach, which does not adequately represent flow in the watershed. Reclamation suggest the CVRWQCB use a physically based distributed model to determine flows and load in the watershed.
17. Page 1-59: Table 4-2 “Design Flows at Vernalis and Descriptive Statistics for Month/Water-Year Type Groupings With VAMP Pulse Flows (taf)”. Table 4-2 appears to satisfy Item 8 of the requirement list. However, using the mean or median value for the design flow as opposed to the low-value would be better. It is understood that by using the low value, an implicit MOS is created. Could the mean or median value be used as explicit MOS (say 20%)? The ratio of the mean value to the low value can range from over 4.0 to slightly above 1.0 for the range water year types and months. The same holds true for the ratio of the median value to the low value. It appears the design flow for some months and year-types (using the low-flow value) is too conservative. For example, for a wet year for the month of January, the mean flow is 477 TAF/mo, while the critical design flow is 101 TAF/mo, giving a ratio of 4.7. By setting the design flow so low, the load allocations would be overly restrictive for that month.
18. Page 1-60: Groundwater Loads. “According to Equation 4-2, salt loads attributable to groundwater accretions must be removed from the total assimilative capacity of the LSJR to determine the loads that is available to be allocated among point and NPS of pollution.” This is not hydrologic reality, if we ignore groundwater, we eliminate the potential to reduce groundwater accretions, which directly increase poor quality water into the SJR. Options such as reducing groundwater deep percolation need to be included in potential solutions. So both point and non-point sources need to account for groundwater accretions.
19. Page 1-61: Background Loads. Reclamation disagrees with the use of 52 mg/l concentration for natural runoff from the coastal range. The assumption that the east side background water quality conditions are identical to the west side is inappropriate. Geological conditions differ substantially between the Sierra Nevada and Coast Range. For example, marine deposits found in the Coast Range (west side) have high salt concentration with background salt sources not found on the east side. The natural flows from the coast range (west side) have a much higher TDS than the Sierra Nevada runoff.
20. Page 1-61: Background Loads. Has the Regional Water Quality Control Board considered background loading from non-point sources, such as groundwater used for irrigation, natural coastal range runoff, and wetlands prior to Delta-Mendota Canal development? These background or pre-CVP development conditions do not appear to be included in the salt balance, and would substantially change load allocations. Large detention dams have been constructed on Los Banos and Little Panoche Creeks, which contribute to the Grasslands inflow. Historically, large wetland areas have concentrated salt through consumptive use, and groundwater irrigation occurred in the study area prior to CVP development.
21. Background Loads: Reviewing background load methods in Appendix D, background salt concentrations were determined by measuring flood flow concentrations with assumed resultant salinity concentrations between 51 and 79 mg/l as background conditions. This

assumption is incorrect when determining pre-development conditions, as historic low flow events would have substantially higher concentrations.

22. Page 1-62, Consumptive Use Allocation: Reclamation understands the CVRWQCB's efforts to adapt the Total Maximum Monthly Load (TMML) methodology when addressing the inherent problems associated with its application to naturally occurring elements in a complex and variable system. Salinity impairment of the San Joaquin River is a function of both load and flow. In the absence of all factors being considered (in the technical report) regarding the Basin's contribution to impairment, is a consumptive use allowance an appropriately applied "remedy"?
23. Page 1-71, Central Valley Impacts: The report identifies impacts of out-of-basin water exports and salt imports from out-of-basin. However, only Reclamation's development receives load allocations. Why does the state account for salt brought into the basin by Reclamation and not consider the dilution factor that is provided by Delta water.
24. Page 1-71, Central Valley Impacts: Why are other water developments excluded from the salinity and boron TMDL? East-side water projects such as Don Pedro and Hetch Hetchy are not identified for their impacts to the San Joaquin River due to modified timing, degraded water quality, and resultant loss of dilution flow.
25. General Comment: An allowance for future growth was not mentioned. Future growth could be analyzed through output from the CALSIM2 model, which has present (2001 level) and future (2020 level) land use.
26. Page 1-79, Second paragraph: Setting Reclamation's load allocation based on Sierra Nevada water quality is inappropriate and does not take into account for impacts from Reclamation lands and facilities, but allocated loading that is a result of activities on private lands. Reclamation's loading should be calculated by adding any pickup in salt and boron that occurs on Reclamation lands. This would include inflows that are allowed into the Delta-Mendota Canal and any changes in water quality that has resulted from DMC water entering the groundwater system on Reclamation lands. In addition, Reclamation should be held accountable for water brought into the basin that exceeds water quality objectives, and not the agricultural concentrating effects of the water use. The farmers should be responsible for salt increases due to agricultural uses.
27. In the document you have presented the results as loads of salt in tons and boron in lbs. In order to do this you had to have a discharge rate and a contaminant concentration. It would be helpful to show the concentrations used to calculate the loading. This would give a better feel of how much the concentrations need to be reduced to meet the water quality objectives for salinity and boron.
28. Appendix E, Alternate Methods For Calculating Salt Loading From The Northwest Side Sub-area Peer Review Draft, Tables E-3 and E-4: Table E-3, Column A, Lower NWS (April-Dec), the acres should be 124,811 as shown in Table E-2. This would result in an Area-Ratio of 18.1, not the 19.5 given. This error is carried over to Table E-4 where the load should be

110,084 tons instead of 118.084 tons given in the table. This gives a total salt load of 162,594 tons instead of the 171,109. This agrees much closer to the 162,695 listed in the text just above Table E-4. Correct the Tables.

29. Page E-14, VI. Results, First Sentence: The 1,000 tons/year needs to be changed to 171,000 tons/year to make it consistent with Table E-12. The natural or non-anthropogenic salt load is not separated for the irrigation induced salt load. This needs to be done to better quantify the salt load that needs to be controlled from the NWS due to man's activities.



**Comments for Lower San Joaquin River  
Salt and Boron Technical Report  
Appendix 4: Economic Analysis**

**Comments**

1. The Economic Analysis report does not mention the potential benefits of meeting the water quality standard. The report summary states that implementation of a control program for salt and boron will require significant expenditures from farmers and wetland operators. Further, the report states that adding additional costs to marginally or unprofitable agricultural operations will be detrimental to interests in the LSJR watershed. Given the magnitude of these costs, justification should have been addressed in the form of benefits of improved water quality.
2. The Economic Analysis report does not address the costs or impacts of not meeting the water quality standard. There is no reference of what would happen if the discharger violated the water quality standard for salt and boron or was unable to meet his responsibility according to one of the alternatives.
3. The Economic Analysis report does not address the potential economic impacts of a re-operation of Friant Dam. If Exchange Contractors are required to restrict or “clean up” their irrigation discharges of DMC water, then it may be economically justified for them to exercise their right to San Joaquin River water, thus requiring Millerton Reservoir to be re-operated. Under this scenario, water that is currently diverted into the Friant-Kern Canal will be released into the San Joaquin River, thus allowing the Exchange Contractors to divert from the San Joaquin. There would be significant economic impacts of taking water away from the Friant-Kern water users.
4. The development of Real Time Management costs appears arbitrary. The Economic Analysis report summary alludes that the Real Time Management alternative is the most viable in that it is the least expensive. However, there appears to be uncertainty in the number of monitoring systems needed, as well as the cost analysis itself whereby the cost estimates and monitoring systems are being based on unreferenced professional judgment.
5. The Economic Analysis report does not show how the profitability of a water user may change as a result of implementing the alternatives. Significant costs to the discharger are indicated in implementing a salt and boron program and some of the major crops grown in the LSJR are not profitable because costs often exceed revenues. Yet, the report stops short in showing how these discharger costs will affect farm profitability throughout the region.
6. If the salinity and boron TMDL was to be implemented as written, the only method to reduce salinity at the source water to a background concentration of 52mg/L is to construct a desalting plant. The construction of this facility would be 20 times larger than the largest desalination facility in the US (Yuma Desalter - 100 MGD). The sub-appraisal level cost to treat the water is estimated at a capital cost of \$1.791 billion with an annual O&M cost exceeding \$125 million. Approximately 12% of the canal water would be lost in the

treatment process. The cost to dispose of the concentrate using evaporation ponds is estimated at \$3.1 billion and would require approximately 100 mi<sup>2</sup> of land. The cost to install a pipeline for the disposal of concentrate to the ocean, if possible, would be less expensive than evaporation ponds. Cost estimates were developed using the USBR WaTER (Water Treatment Estimation Routine) program and other internal programs.

**Comments for Lower San Joaquin River  
Amendments to  
The Water Quality Control Plan for  
The Sacramento River and San Joaquin  
River Basins**

**Comments**

1. Page 18: Action #12. Supply water Load Allocation are established for salts in irrigation water imported to the LSJR Watershed from the Sacramento/San Joaquin River Delta. The DMC was developed to reuse water coming down the Sacramento/San Joaquin River that had acceptable water quality to meet additional beneficial uses in the upper SJR basin. Establishing load allocation to water collected downstream of Vernalis based on pristine Sierra Nevada water quality and of better quality than state water quality objectives at Vernalis effectively requires Reclamation to clean up loading from all upstream polluters. Reclamation finds this totally unacceptable and encourages the board to find a more equitable solution.
2. Page 20: The background loading is calculated using the EC value of 85  $\mu\text{S}/\text{cm}$ . The January 2002 Staff Report Appendix D describes that “The average base TDS concentration for the Merced, Tuolumne, and Stanislaus Rivers was determined to be approximately 52 mg/L and the average base TDS concentration for the LSJR above Salt Slough was determined to be approximately 79 mg/L. This value is based on the concentrations in the contributing reservoirs in these rivers during high flows periods.” High flow and flood periods are not constant events, the historical high flow periods may not reappear in the future. This calculated (or observed) concentration does not accurately represent current and future background loading. In addition, the anthropogenic load should not be excluded from the background load calculation due to the development of the upper watershed in the recent decades.
3. Page 21: Table IV-7, The Monthly groundwater Loading ( $L_{\text{GW}}$ ) Table assumes that “groundwater accretions remain constant for all year types.” The Table should reflect that groundwater tables fluctuate seasonally and varies according to different water years. During wet years, the water table will be replenished but for the dry years the water table will diminish. Also, the deep percolation and leakage from groundwater is not accounted for in the table. The groundwater load calculation needs further evaluation.
4. Page 23: Supply Water Allocations. Reclamation disagrees with method used for allocating load from the DMC. Reclamation should be held accountable for increases in loading that are a direct result of Reclamation’s actions. This would include increases in salinity and boron from Tracy to the Mendota Pool, any seepage into the groundwater system from Reclamation owned canals and laterals, and water diverted that does not meet water quality objectives at Vernalis.
5. Page 50, Evaluation of Option 8: The dischargers cost analysis of “Medium” is understated. Reclamation’s administrative costs would be high due to the number of discharge points

Reclamation would need to monitor. The cost of compliance would be very high if Reclamation had to reallocate or purchase additional water for dilution flows at Vernalis. The economic and physical affects of reallocating the loads to high flow periods could cause wide spread disruption in the agricultural marketplace in the San Joaquin Valley. Surface storage of selenium-tainted drain water may be cost prohibitive and underground storage may cause economical irretrievable losses to the soil profile resources. Many wells on the west side of the valley are prohibited by Reclamation from discharging into Reclamation facilities (DMC) due to the high boron concentrations. This ground water pumping is outside of Reclamation's control and will be problematic during a "normal" water year. During a drought year, i.e. low water allocation, ground water pumping will increase substantially and will create an undue hardship on Reclamation if Reclamation is primarily responsible to meet the Salt and Boron TMDL on the Lower San Joaquin River.

6. Page 67, Summary of Implementation Option Evaluation. General Comments. Reclamation agrees with method of evaluating the cost to dischargers, state cost, flexibility, time to implement, likelihood of success and consistency with state and federal law. On the options that involve Reclamation we would encourage the state to work directly with Reclamation on developing impacts on the evaluation criteria. For example, it does not appear that the state considered Reclamation law when determining consistency with State and Federal laws.
7. Page 69, Alternatives. When looking at alternatives there is not enough detail to accurately assess the effectiveness of the individual alternatives. The use of focused prohibition of discharge and general and individual waste discharge requirements could have an adverse effect if surface water was intentionally allowed to infiltrate into the groundwater system to meet permitting requirements. Reclamation recommends that the state target at least one alternative toward reducing inflows into the groundwater system. Also, it appears that the state is assuming that a reduction in salt load from one portion of the basin will equate to an equivalent reduction at Vernalis. With the vast amount of salt in storage in the San Joaquin we do not believe that this will be the case.